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DIETETIC AND PROFESSIONAL PRACTICE

Evaluation of change in dietitians' perceived comprehensibility and difficulty of the Patient-Generated Subjective Global Assessment (PG-SGA) after a single training in the use of the instrument

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Keywords

dietetic practice, education, malnutrition, nutritional assessment, nutritional status, PG-SGA.

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Abstract

Background: The Patient-Generated Subjective Global Assessment (PG-SGA) is an instrument used to assess malnutrition and its risk factors. Some items of the PG-SGA may be perceived as hard to comprehend or as difficult by healthcare professionals. The present study aimed to determine whether and how dietitians' perceptions of comprehensibility and difficulty of the PG-SGA change after a single training in PG-SGA use.

Methods: In this prospective evaluation study, Dutch PG-SGA-naïve dietitians completed a questionnaire regarding perceived comprehensibility and difficulty of the PG-SGA before (T0) and after (T1) receiving a single training in the use of the instrument. Perceived comprehensibility and difficulty were operationalised by calculating item and scale indices for comprehensibility (I-CI, S-CI) and difficulty (I-DI, S-DI) at T0 and T1. An item index of 0.78 was considered acceptable, a scale index of 0.80 was considered acceptable and a scale index of 0.90 was considered excellent.

Results: A total of 35 participants completed the questionnaire both at T0 and T1. All item indices related to comprehensibility and difficulty improved, although I-DI for the items regarding food intake and physical examination remained below 0.78. Scale indices for difficulty and comprehensibility of the PG-SGA changed significantly ($P < 0.001$) from not acceptable at T0 (S-CI = 0.69; S-DI = 0.57) to excellent for comprehensibility (S-CI = 0.95) and acceptable for difficulty (S-DI = 0.86) at T1.

Conclusions: The findings of the present study suggest that significant improvement in PG-SGA-naïve dietitians' perception of comprehensibility and difficulty of the PG-SGA can be achieved quickly by providing a 1 day of training in the use of the PG-SGA.

Introduction

The Scored Patient-Generated Subjective Global assessment (PG-SGA; Copyright FD Ottery, 2005, 2006, 2015) was developed as a modification of the Subjective Global Assessment ⁽¹⁾ and can be used to assess malnutrition in the sense of undernutrition, as well as its underlying risk factors. ^(2,3) The PG-SGA includes a patient-generated component and a professional component, thus providing cumulative insight from both perspectives with respect to the nutritional status of the patient. The PG-SGA was first validated in the oncology setting ^(3–6) and has subsequently been validated in other settings, such as nephrology and geriatric settings ^(7,8).

Recently, the PG-SGA has been translated and culturally adapted for the Dutch setting ⁽⁹⁾. During the pilot testing of the prototype of the Dutch version, the perceived level of difficulty and comprehensibility of the PG-SGA were explored. Although patients perceived the patient-generated component of the PG-SGA as sufficiently easy and comprehensible, healthcare professionals perceived comprehensibility of the professional component as acceptable but the level of difficulty as not acceptable. The concept of comprehensibility reflects the level of clarity of an instrument as perceived by the user. The related concept of difficulty reflects the level of both knowledge and skills of the user of the instrument. Perceived lack of comprehensibility of an item (e.g. as a result of the use of vocabulary that does not correspond with the respondents' education level) reduces understandability and may increase perceived difficulty of this item ^(10–12).

We hypothesised that perception of comprehensibility may change positively by providing an explanation of the meaning of each item of the PG-SGA and perception of difficulty may change positively by providing background information, instruction and/or training regarding the PG-SGA ⁽¹²⁾. Because, in daily practice, dietitians are healthcare professionals who often work with the PG-SGA, in the present study, we aimed to determine whether and how perceived comprehensibility and difficulty changes after providing training comprising lectures on the PG-SGA (rationale and evidence-base), as well as hands-on practice with the PG-SGA, in an omnifarious sample of dietitians.

Materials and methods

Sample and data collection

In this prospective evaluation study, characteristics of perceived difficulty and comprehensibility of version 3.6 of the Dutch PG-SGA at baseline and after receiving a full

day of training in the use of the PG-SGA were evaluated in a convenient sample of dietitians. Dietitians located in The Netherlands were informed about the training via social media and e-mail. The training was developed in collaboration with the originator of the PG-SGA, and accredited for dietitians by the Dutch Foundation on Accreditation of Competence Stimulating Activities for healthcare workers. Because the PG-SGA had only recently become available in the Dutch language, professionals had little to no experience with the Dutch version of the instrument. All 79 individuals who registered for the training were approached to participate in the study. Participants who were not trained at bachelor or higher level as a dietitian were excluded from the study. A lecture that explained the rationale behind the PG-SGA and a lecture demonstrating the use of the PG-SGA and its electronic version were provided in the morning. In a workshop in the afternoon, attendees practiced with the PG-SGA, including the physical examination, and discussed the use and interpretation of the PG-SGA.

Three weeks prior to the training, registered professionals were invited to complete a home assignment and were informed about the project. Professionals provided their written consent before participating in the study. At baseline (T0), participants were asked to first complete both the patient and professional component of the PG-SGA, preferably with a patient, and, subsequently, to complete the online questionnaire. The second measurement (T1) followed directly after the training, at the training site. At T1, attendees were asked to complete a paper version of the questionnaire to stimulate immediate completion of the questionnaire and to prevent loss to follow-up. To further prevent loss to follow-up, 5 days after the training, a reminder was sent to participants who did not complete the questionnaire at the training site. These participants were asked to complete an online version of the questionnaire.

The Medical Ethical Committee of the University Medical Center Groningen ruled that no permission was needed to perform the study (reference M14.165328) because the study was not under the regulation of the 'Medical Research Involving Human Subjects Act' (WMO).

Patient-Generated Subjective Global Assessment

The PG-SGA (Appendix 1) consists of a patient-generated and a professional component. First, the patient-generated component includes four topic-specific Boxes designed to be completed by the patient. Box 1 addresses weight history. Box 2 addresses food intake. Box 3 addresses nutrition impact symptoms and other factors hindering food intake. Box 4 includes activity and

function and is based on the Eastern Cooperative Oncology Group (ECOG) performance status⁽¹³⁾. Second, the professional component includes five Worksheets and is completed by the healthcare professional. Worksheet 1 instructs on how to score the percentage weight loss. Worksheet 2 addresses conditions that may increase nutritional risk. Worksheet 3 addresses metabolic stress. Worksheet 4 includes a nutrition-focused physical examination. Worksheet 5 categorises the overall global assessment of the patient. Categories include Stage A = Well nourished; Stage B = Moderate/suspected malnutrition; and Stage C = Severely malnourished⁽⁴⁾. Finally, a score is generated that guides triage recommendations for interdisciplinary interventions.

Comprehensibility and difficulty

Comprehensibility and difficulty were measured using a questionnaire, which is available upon request. The questionnaire was pretested for clarity in three final year Bachelor Students of Nutrition and Dietetics. The questionnaire opened with four items on demographics. Furthermore, it included 14 items regarding perceived comprehensibility and 14 items on difficulty of the PG-SGA. For both comprehensibility and difficulty, questionnaire items 1–4 referred to Box 1–4 of the PG-SGA. Questionnaire items 5–8 referred to Worksheet 1–3. In our preceding study, we found that Worksheet 4 (Physical Examination) may be perceived as difficult by professionals⁽⁹⁾. Therefore, more questions (items 9–12) were posed on Worksheet 4 compared to the other Boxes and Worksheets. Items 13 and 14 related to Worksheet 5 (Global Assessment Categories) and the nutritional triage recommendations, respectively.

To be able to differentiate between the level of comprehensibility and difficulty, both concepts were included in the questionnaire in the present study. As proposed previously, a four-point scale (1 = very unclear/very difficult; 2 = unclear/difficult; 3 = clear/easy; 4 = very clear/very easy) was used to avoid the possibility of a neutral and ambivalent midpoint^(14–16). Scores 1 and 2 were considered 'not present' and scores 3 and 4 were considered 'present'^(14–16). For each item, an item comprehensibility index (I-CI) and an item difficulty index (I-DI) were calculated at T0 and T1. The I-CI and I-DI indicate the level of knowledge and level of clarity of each item as perceived by the respondents, respectively. I-CI and I-DI scores can range from 0 to 1 and were calculated by dividing the number of respondents who considered the item to be 'present' by the total number of respondents.

In accordance with our previous study, I-CI and I-DI ≥ 0.78 were considered acceptable⁽⁹⁾. An item score < 0.78 requires further analysis of the item⁽¹⁷⁾. I-CI and I-DI

scores of all items were averaged into a weighted summarised scale comprehensibility index (S-CI) and a scale difficulty index (S-DI) for the full PG-SGA. The S-CI and S-DI reflect respondents' perceived overall knowledge and overall comprehensibility level of the instrument, respectively. S-CI ≥ 0.80 and S-DI ≥ 0.80 were considered as acceptable scores, S-CI ≥ 0.90 and S-DI ≥ 0.90 were considered as excellent scores^(17,18). Item nonresponse was excluded from calculation of the index scores. Transparency of response was provided by reporting item response and overall response percentages.

Statistical analysis

We performed power analysis for S-DI because, in a pilot study, S-DI was rated at 0.55 by healthcare professionals (i.e. not acceptable), whereas S-CI was rated at 0.81, which is already acceptable⁽⁹⁾. A minimal sample of eight dietitians was considered sufficiently powered to detect a change of S-DI from 0.55 to S-DI 0.80 (cut-off for acceptable), with estimated variability of 0.25 (allowing a type I error $\alpha = 0.05$ and a type II error $\beta = 0.20$)⁽¹⁹⁾.

Although S-CI and S-DI scores can range from 0 to 1, they can be considered as nominal scores, transformed to weighted average scores. Therefore, the nonparametric Wilcoxon signed rank test was used to test significance of differences in distribution of participants' comprehensibility and difficulty indices at T0 and T1. The Mann–Whitney *U*-test was used to compare the distribution of the T0 results of participants who completed the questionnaire both at T0 and T1 with the distribution of the T0 results of participants who were lost to follow-up. Participants who were lost to follow-up were not included in the analysis. However, to test the robustness of the results, the T0 scores of the missing participants were imputed to the T1 scores, and the Wilcoxon signed rank test was used in a sensitivity analysis. All statistical tests were performed using SPSS, version 24 (IBM Corp., Armonk, NY, USA). $P = 0.05$ was considered statistically significant.

Results

In total, 56/79 (79%) professionals responded at T0, of whom 47 (60%) were considered eligible and gave their consent. Of these 47 professionals, 35 (75%) completed the questionnaire both at T0 and T1 and were included in the analysis. Reasons for not completing the post-training questionnaire were a lack of time and absence during the training. Two out of 35 participants were not currently practicing as dietitians. The characteristics of the participants who completed the questionnaire both at T0 and T1 are presented in Table 1.

Table 1 Characteristics of dietitians that participated in exploration of perceived comprehensibility and difficulty of the Patient-Generated Subjective Global Assessment (PG-SGA) before and after training in its use

Characteristics	<i>n</i>	%
Participants	35	100
Dietitian	33	94
Other*	2	6
Working setting†	45	100
General hospital	17	38
Geriatrics/nursing home/rehabilitation	10	22
Primary care	7	16
Academic hospital	4	9
Tertiary care health centre	4	9
Other	3	7
Field of interest†	75	100
Oncology	14	19
Gastroenterology/diabetes	13	17
Malnutrition	9	12
Lung disease	7	9
Nephrology	6	8
Geriatrics	6	8
Pediatrics	5	7
Other	15	20
Reason for registering for the PG-SGA training†	38	100
Interest in PG-SGA	9	24
Interest in malnutrition assessment	8	21
The opportunity was provided	6	16
Interest in malnutrition screening	5	13
Interest in the electronic version of the PG-SGA (Pt-Global app)	4	11
Interest in improving nutrition care	3	8
Professional development	2	5
Interest in PG-SGA SF	1	3
	Median	Min–Max
Years of work experience	14	0–38

*One teacher in Program Nutrition and Dietetics; one junior researcher with background in dietetics.

†More than one setting, and/or field of interest, and/or reason for registering possible per participant.

SF, Short Form.

Indices and response rates for comprehensibility and difficulty of the PG-SGA are reported in Table 2. Appendix 2 presents the summarised frequency of scores 1, 2, 3 and 4 at both T0 and T1. Overall, comprehensibility and difficulty indices significantly improved after the training ($P < 0.01$). At T0, comprehensibility and difficulty of the PG-SGA were not perceived acceptable on scale level (S-CI = 0.69; overall response 93%; S-DI = 0.57, overall response 92%). After the training, comprehensibility was perceived as excellent on scale level (S-CI = 0.95; overall response 97%) and difficulty of the PG-SGA was perceived as acceptable (S-DI = 0.86, overall response 96%). S-CI improved in 30 participants and remained stable in

five participants. S-DI improved in 29 participants, remained stable in two participants and decreased in four participants.

At T0, the lowest I-CI was found on the item concerning Worksheet 2 (Disease and relation to nutritional requirements; I-CI = 0.38) and the highest I-CI were found for the items regarding Worksheet 1 (Scoring Weight Loss; I-CI = 0.94). At T0, the lowest I-DI scores were found on the items regarding Worksheet 4 (Physical Examination; I-DI = 0.13–0.35). Furthermore, the highest I-DI score was found on the item concerning Box 3 (Symptoms; I-DI = 0.80) and the items regarding Worksheet 1 (Scoring Weight Loss; I-DI = 0.84–0.88).

At T1, all items had I-CI scores above the threshold of 0.78. Furthermore, maximum I-CI score of 1.0 was reached in Worksheet 1 items (Scoring Weight Loss), Worksheet 5 (Global Assessment Categories) and Total PG-SGA Score. At T1, the I-DI for items concerning Box 2 [Food intake (I-DI=0.76)] and Worksheet 4 [Physical Examination (I-DI=0.53–0.71)] still scored below the threshold of 0.78. Moreover, maximum I-DI score of 1.0 was reached on items concerning Box 4 (Activity and Function), Worksheet 1 (Scoring Weight Loss), Worksheet 5 (Global Assessment Categories) and Total PG-SGA Score.

Distribution of T0 indices for comprehensibility and difficulty of participants who were lost to follow-up was not significantly different from those of participants who completed the questionnaire both at T0 and T1 ($P = 0.15$ and $P = 0.21$, respectively). After the T0 scores of the missing participants were imputed to the T1 scores, median improvement of comprehensibility and difficulty indices remained significant between T0 and T1 ($P < 0.01$).

Discussion

The results of the present study show that perceived comprehensibility and difficulty of the PG-SGA improved significantly in a sample of PG-SGA-naïve dietitians, after providing information and hands-on training in the use of the PG-SGA. Although perceived comprehensibility improved to an acceptable level for all components of the PG-SGA, perceived difficulty for the physical examination and food intake remained under the predefined cut-off for acceptability. Overall scores for comprehensibility improved from not acceptable at baseline to excellent after training. Overall scores for difficulty improved from not acceptable at baseline to acceptable after training.

The items related to the physical examination were perceived as the most difficult component of the PG-SGA, in accordance with the findings of the pretesting of the Dutch version of the PG-SGA⁽⁹⁾. Scores on difficulty

Table 2 Comprehensibility and difficulty indices and response rates scored by dietitians for items of the Patient-Generated Subjective Global Assessment (PG-SGA) before (T0) and after (T1) receiving a single training

Items	Comprehensibility T0 (<i>n</i> = 35) I-CI T0 (<i>n</i> response)	Comprehensibility T1 (<i>n</i> = 35) I-CI T1 (<i>n</i> response)	Difficulty T0 (<i>n</i> = 35) I-DI T0 (<i>n</i> response)	Difficulty T1 (<i>n</i> = 35) I-DI T1 (<i>n</i> response)
Box 1	0.86 (<i>N</i> = 35)	0.97 (<i>N</i> = 33)	0.74 (<i>N</i> = 35)	0.88 (<i>N</i> = 34)
Box 2	0.69 (<i>N</i> = 35)	0.79 (<i>N</i> = 33)	0.57 (<i>N</i> = 35)	0.76 (<i>N</i> = 34)
Box 3	0.89 (<i>N</i> = 35)	0.94 (<i>N</i> = 33)	0.80 (<i>N</i> = 35)	0.94 (<i>N</i> = 33)
Box 4	0.80 (<i>N</i> = 35)	0.97 (<i>N</i> = 33)	0.76 (<i>N</i> = 33)	1.00 (<i>N</i> = 31)
Worksheet 1 explanation	0.94 (<i>N</i> = 32)	0.97 (<i>N</i> = 35)	0.88 (<i>N</i> = 32)	0.94 (<i>N</i> = 34)
Worksheet 1 items	0.94 (<i>N</i> = 32)	1.00 (<i>N</i> = 34)	0.84 (<i>N</i> = 32)	1.00 (<i>N</i> = 35)
Worksheet 2	0.38 (<i>N</i> = 32)	0.97 (<i>N</i> = 35)	0.50 (<i>N</i> = 32)	0.97 (<i>N</i> = 35)
Worksheet 3	0.77 (<i>N</i> = 31)	0.94 (<i>N</i> = 35)	0.72 (<i>N</i> = 32)	0.97 (<i>N</i> = 35)
Worksheet 4 explanation	0.50 (<i>N</i> = 32)	0.94 (<i>N</i> = 32)	0.35 (<i>N</i> = 31)	0.70 (<i>N</i> = 33)
Worksheet 4 muscle	0.41 (<i>N</i> = 32)	0.91 (<i>N</i> = 35)	0.16 (<i>N</i> = 32)	0.53 (<i>N</i> = 32)
Worksheet 4 fat	0.44 (<i>N</i> = 32)	0.94 (<i>N</i> = 35)	0.13 (<i>N</i> = 32)	0.59 (<i>N</i> = 32)
Worksheet 4 fluids	0.50 (<i>N</i> = 32)	0.97 (<i>N</i> = 35)	0.19 (<i>N</i> = 32)	0.71 (<i>N</i> = 35)
Worksheet 5	0.75 (<i>N</i> = 32)	1.00 (<i>N</i> = 34)	0.60 (<i>N</i> = 30)	1.00 (<i>N</i> = 34)
PG-SGA point score	0.81 (<i>N</i> = 32)	1.00 (<i>N</i> = 35)	0.69 (<i>N</i> = 29)	1.00 (<i>N</i> = 35)
Overall item response	S-CI 0.69 93%	S-CI 0.95 97%	S-DI 0.57 92%	S-DI 0.86 96%

I-CI, Item Comprehensibility Index; I-DI, Item Difficulty Index; S-CI, Scale Comprehensibility Index; S-DI, Scale Difficulty Index.

Italic print indicates a score below an acceptable level of 0.78 for I-CI and I-DI, respectively, and 0.80 for S-CI and S-DI, respectively.

Bold print indicates a summarized score on scale level.

improved after a single training but not to an acceptable level, implying that perceived difficulty of the physical examination could still improve. Scores on comprehensibility for items related to the physical examination did improve to an acceptable level, implying that the explanation of the physical examination was helpful with respect to clarifying Worksheet 4 (Physical examination). It is unclear why participating dietitians regarded the physical examination of the PG-SGA clear but difficult. A possible explanation would be that some dietitians did not feel confident to examine and interpret signs of loss or deficit of muscle and/or fat in their own patients after a single training. These dietitians may need repeated hands-on training and practice. It is not reported how often professionals actually receive training in the use of nutritional assessment tools such as PG-SGA or the SGA, and how a lack of training may influence the results of the physical examination. We hypothesise that sufficient knowledge and experience could improve perceived difficulty of the physical examination and, additionally, may lead to more reliable results. A recent study showed that dietitians who received training in the use of the PG-SGA presented good reliability in assessment (intraclass correlation of 0.90; $P < 0.001$)⁽²⁰⁾. Results from a study on inter-rater reliability (IRR) utilising the SGA indicate in the same direction⁽²¹⁾. In that study, more experienced professionals (>5 years after graduation) utilising the SGA showed similar results (IRR range of 89–100%) compared to a well-trained and experienced dietitian (>20 years after

graduation), whereas less experienced professionals (1–2 years after graduation) showed an IRR range of 56–100% compared to the same dietitian⁽²¹⁾.

Notably, dietitians experienced some difficulty in interpreting an item from the patient-generated component. Although scores for item comprehensibility for Box 2 (Food intake) improved to an acceptable level after training, scores on difficulty remained slightly below an acceptable level, with an I-DI of 0.76. Box 2 is one of the four Boxes designed to be completed by patients. Difficulty of these items may be perceived differently when tested in a patient population compared to a sample of professionals. During the pilot testing of the prototype of the Dutch version in a small sample of patients, the level of difficulty and comprehensibility of Box 2 was perceived as acceptable⁽⁹⁾. Additionally, a different study reported that patients with cancer found the patient-generated component of the PG-SGA not difficult and not hard to understand⁽²²⁾. We suggest testing the patient-generated component of the PG-SGA in a larger sample of patients, representing different patient populations, aiming to evaluate whether adjustment or further explanation is needed.

Interestingly, some participants perceived the PG-SGA as more difficult after the training, despite an improvement in perceived comprehensibility. These participants may have been unaware of a lack of knowledge or experience in performing the PG-SGA assessment prior to the training. After the training, they may have improved their

understanding of the PG-SGA and, consequently, may be more conscious of a possible lack of knowledge or experience. In that case, dietitians may also profit from repeated practice and hands on training with the PG-SGA.

This is the first study to evaluate changes in perception of difficulty and comprehensibility of the PG-SGA after training in an omnifarious sample of dietitians. The results are of interest because a single training can be performed quickly and at low expense. The study has some limitations. First, as a result of the design of the study, we did not have access to a control group. The effects of the training may have been positively influenced, and some improvements may have resulted from an increased familiarity of participants with the PG-SGA at T1 compared to T0 because of repetition. However, we attempted to temper the potential positive effect of repetition by incorporating an interval of 3 weeks between inviting participants to complete the questionnaire at T0 and repetition at T1⁽²³⁾. Second, in the present study, we assessed only the short-term effects of the training. As a result of the 'single training' design, we did not acquire data on longer-term effects of the training and thus it is unclear how the level of perceived comprehensibility and difficulty changes over time. Third, the training subject was the PG-SGA, and approximately 40% of participants reported to have registered for the training because of an interest in the (electronic version of the) PG-SGA or PG-SGA Short Form (SF). These dietitians may be more interested in the PG-SGA than average and, subsequently, have a more positive view of the PG-SGA than average. Therefore, some response bias cannot be ruled out. However, we attempted to encourage all types of dietitians to enroll by limiting the registration fee and by awarding accreditation points. Moreover, scale difficulty and scale comprehensibility were well under acceptable scores at T0 ($S-CI = 0.69$, $S-DI = 0.57$), indicating that the results were not influenced by a positive attitude prior to the training. Fourth, participants were almost exclusively dietitians, which makes it difficult to generalise the results to other healthcare professionals. However, dietitians are amongst those professionals who are most likely to work with the PG-SGA in practice. Finally, 25% of participants were lost to follow-up. However, the distribution of baseline results for comprehensibility and difficulty of respondents who were lost to follow-up did not significantly differ from those of respondents who completed the questionnaire both times; thus, loss to follow-up appears to be random. If the baseline scores of the missing participants are imputed to the T1 scores, perceived level of comprehensibility and difficulty would still significantly have improved between T0 and T1 ($\alpha < 0.001$).

Perceived comprehensibility and difficulty are concepts related to each other^(11,12). We hypothesise that

providing sufficient clarity is conditional to be able to accurately identify and overcome concerns with the difficulty of the PG-SGA. A dual approach towards improving clarity and knowledge and skills may lead to greater confidence in the use of the PG-SGA among dietitians, which in turn could further stimulate implementation of the PG-SGA in practice. To further improve perceived level of difficulty, supplemental information such as online materials or instruction videos for dietitians may be helpful. Furthermore, we suggest independently starting training in the use of the skills required to adequately perform a nutrition-focused physical assessment during the education of dietitians, preferably with practice sessions involving actual patients. In The Netherlands, several Programs on Nutrition and Dietetics have already incorporated training in the use of the PG-SGA in their curriculum.

Conclusions

The findings of the present study suggest that significant improvement in PG-SGA-naïve dietitians' perception of difficulty and comprehensibility of the PG-SGA can be achieved quickly by providing training in the use of the PG-SGA. Although perceived comprehensibility improved to an acceptable level for all components of the PG-SGA, perceived difficulty for the physical examination still required further improvement after a single training, suggesting that supplemental information and/or more training may be needed for PG-SGA-naïve dietitians to ensure an acceptable level of perceived difficulty of all components of the PG-SGA, including the physical examination.

Transparency declaration

The lead author affirms that this manuscript is an honest, accurate and transparent account of the study being reported. The reporting of this work is compliant with STROBE guidelines. The study was not registered in a public trials register because the study did not concern a clinical investigation and was not under the regulation of the 'Medical Research Involving Human Subjects Act'. However, the lead author affirms that no important aspects of the study have been omitted and that any discrepancies from the study as planned have been explained.

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Conflict of interest, source of funding and authorship

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We have read and understood Journal of Human Nutrition and Dietetics policy on declaration of interests and declare the following interests: Martine J. Sealy, Jan L. N. Roodenburg and Cees P. van der Schans declare that they have no conflicts of interest to report. Faith D. Ottery: President of Ottery & Associates LLC, copyright holder of the Patient-Generated Subjective Global Assessment (PG-SGA), co-owner and co-developer of the PG-SGA based Pt-Global app. Harriët Jager-Wittenaar: Co-developer of the PG-SGA based Pt-Global app.

Martine J. Sealy was responsible for the study design, data collection, analysis and interpretation, and the writing of the manuscript. Faith D. Ottery, Jan L.N. Roodenburg, Cees P. van der Schans and Harriet Jager-Wittenaar were responsible for the study design, analysis and interpretation, and critically reviewing the manuscript. All named authors have approved the final version submitted for publication.

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Appendix 1

PG-SGA metric version 3.22.15.



Scored Patient-Generated Subjective Global Assessment (PG-SGA)

History: Boxes 1 - 4 are designed to be completed by the patient.
[Boxes 1-4 are referred to as the PG-SGA Short Form (SF)]

1. Weight (See Worksheet 1)

In summary of my current and recent weight:

I currently weigh about _____ kg

I am about _____ cm tall

One month ago I weighed about _____ kg

Six months ago I weighed about _____ kg

During the past two weeks my weight has:

☐ decreased ⁽¹⁾ ☐ not changed ⁽⁰⁾ ☐ increased ⁽⁰⁾

Box 1 ☐

Patient Identification Information

2. Food intake: As compared to my normal intake, I would rate my food intake during the past month as

- ☐ unchanged ⁽⁰⁾
☐ more than usual ⁽⁰⁾
☐ less than usual ⁽¹⁾

I am now taking

- ☐ normal food but less than normal amount ⁽¹⁾
☐ little solid food ⁽²⁾
☐ only liquids ⁽³⁾
☐ only nutritional supplements ⁽³⁾
☐ very little of anything ⁽⁴⁾
☐ only tube feedings or only nutrition by vein ⁽⁰⁾

Box 2 ☐

3. Symptoms: I have had the following problems that have kept me from eating enough during the past two weeks (check all that apply)

- ☐ no problems eating ⁽⁰⁾ ☐ vomiting ⁽³⁾
☐ no appetite, just did not feel like eating ⁽³⁾ ☐ diarrhea ⁽³⁾
☐ nausea ⁽¹⁾ ☐ dry mouth ⁽¹⁾
☐ constipation ⁽¹⁾ ☐ smells bother me ⁽¹⁾
☐ mouth sores ⁽²⁾ ☐ feel full quickly ⁽¹⁾
☐ things taste funny or have no taste ⁽¹⁾ ☐ fatigue ⁽¹⁾
☐ problems swallowing ⁽²⁾
☐ pain; where? ⁽³⁾ _____
☐ other ⁽¹⁾ ** _____
☐ **Examples: depression, money, or dental problems

Box 3 ☐

4. Activities and Function:

Over the past month, I would generally rate my activity as:

- ☐ normal with no limitations ⁽⁰⁾
☐ not my normal self, but able to be up and about with fairly normal activities ⁽¹⁾
☐ not feeling up to most things, but in bed or chair less than half the day ⁽²⁾
☐ able to do little activity and spend most of the day in bed or chair ⁽³⁾
☐ pretty much bed ridden, rarely out of bed ⁽³⁾

Box 4 ☐

The remainder of this form is to be completed by your doctor, nurse, dietitian, or therapist. Thank you.

Additive Score of Boxes 1-4 ☐ **A**

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email: faithotteryvmdphd@aol.com or info@pt-global.org

Scored Patient-Generated Subjective Global Assessment (PG-SGA)

<p>Worksheet 1 – Scoring Weight Loss</p> <p>To determine score, use 1-month weight data if available. Use 6-month data only if there is no 1-month weight data. Use points below to score weight change and add one extra point if patient has lost weight during the past 2 weeks. Enter total point score in Box 1 of PG-SGA.</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <th style="text-align: left;">Weight loss in 1 month</th> <th style="text-align: center;">Points</th> <th style="text-align: left;">Weight loss in 6 months</th> </tr> <tr> <td>10% or greater</td> <td style="text-align: center;">4</td> <td>20% or greater</td> </tr> <tr> <td>5-9.9%</td> <td style="text-align: center;">3</td> <td>10- 19.9%</td> </tr> <tr> <td>3-4.9%</td> <td style="text-align: center;">2</td> <td>6- 9.9%</td> </tr> <tr> <td>2-2.9%</td> <td style="text-align: center;">1</td> <td>2- 5.9%</td> </tr> <tr> <td>0-1.9%</td> <td style="text-align: center;">0</td> <td>0- 1.9%</td> </tr> </table> <p style="text-align: right;">Numerical score from Worksheet 1 <input style="width: 50px;" type="text"/></p>	Weight loss in 1 month	Points	Weight loss in 6 months	10% or greater	4	20% or greater	5-9.9%	3	10- 19.9%	3-4.9%	2	6- 9.9%	2-2.9%	1	2- 5.9%	0-1.9%	0	0- 1.9%	<p style="text-align: right;">Additive Score of Boxes 1-4 (See Side 1) <input style="width: 50px;" type="text"/> A</p> <p>5. Worksheet 2 – Disease and its relation to nutritional requirements:</p> <p>Score is derived by adding 1 point for each of the following conditions:</p> <table style="width: 100%;"> <tr> <td><input type="checkbox"/> Cancer</td> <td><input type="checkbox"/> Presence of decubitus, open wound or fistula</td> </tr> <tr> <td><input type="checkbox"/> AIDS</td> <td><input type="checkbox"/> Presence of trauma</td> </tr> <tr> <td><input type="checkbox"/> Pulmonary or cardiac cachexia</td> <td><input type="checkbox"/> Age greater than 65</td> </tr> <tr> <td><input type="checkbox"/> Chronic renal insufficiency</td> <td></td> </tr> </table> <p>Other relevant diagnoses (specify) _____</p> <p>Primary disease staging (circle if known or appropriate) I II III IV Other _____</p> <p style="text-align: right;">Numerical score from Worksheet 2 <input style="width: 50px;" type="text"/> B</p>	<input type="checkbox"/> Cancer	<input type="checkbox"/> Presence of decubitus, open wound or fistula	<input type="checkbox"/> AIDS	<input type="checkbox"/> Presence of trauma	<input type="checkbox"/> Pulmonary or cardiac cachexia	<input type="checkbox"/> Age greater than 65	<input type="checkbox"/> Chronic renal insufficiency																																										
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<p>6. Worksheet 3 – Metabolic Demand</p> <p>Score for metabolic stress is determined by a number of variables known to increase protein & caloric needs. Note: Score fever intensity or duration, whichever is greater. The score is additive so that a patient who has a fever of 38.8 °C (3 points) for < 72 hrs (1 point) and who is on 10 mg of prednisone chronically (2 points) would have an additive score for this section of 5 points.</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <th style="text-align: left;">Stress</th> <th style="text-align: center;">none (0)</th> <th style="text-align: center;">low (1)</th> <th style="text-align: center;">moderate (2)</th> <th style="text-align: center;">high (3)</th> </tr> <tr> <td>Fever</td> <td>no fever</td> <td>> 37.2 and < 38.3</td> <td>≥ 38.3 and < 38.8</td> <td>≥ 38.8 °C</td> </tr> <tr> <td>Fever duration</td> <td>no fever</td> <td>< 72 hours</td> <td>72 hours</td> <td>> 72 hours</td> </tr> <tr> <td>Corticosteroids</td> <td>no corticosteroids</td> <td>low dose (< 10 mg prednisone equivalents/day)</td> <td>moderate dose (≥ 10 and < 30 mg prednisone equivalents/day)</td> <td>high dose (≥ 30 mg prednisone equivalents/day)</td> </tr> </table> <p style="text-align: right;">Numerical score from Worksheet 3 <input style="width: 50px;" type="text"/> C</p>		Stress	none (0)	low (1)	moderate (2)	high (3)	Fever	no fever	> 37.2 and < 38.3	≥ 38.3 and < 38.8	≥ 38.8 °C	Fever duration	no fever	< 72 hours	72 hours	> 72 hours	Corticosteroids	no corticosteroids	low dose (< 10 mg prednisone equivalents/day)	moderate dose (≥ 10 and < 30 mg prednisone equivalents/day)	high dose (≥ 30 mg prednisone equivalents/day)																																															
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<p>7. Worksheet 4 – Physical Exam</p> <p>Exam includes a subjective evaluation of 3 aspects of body composition: fat, muscle, & fluid. Since this is subjective, each aspect of the exam is rated for degree. Muscle deficit/loss impacts point score more than fat deficit/loss. Definition of categories: 0 = no abnormality, 1+ = mild, 2+ = moderate, 3+ = severe. Rating in these categories is <i>not</i> additive but are used to clinically assess the degree of deficit (or presence of excess fluid).</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; vertical-align: top;"> <p>Muscle Status</p> <table style="width: 100%;"> <tr><td>temples (temporalis muscle)</td><td>0</td><td>1+</td><td>2+</td><td>3+</td></tr> <tr><td>clavicles (pectoralis & deltoids)</td><td>0</td><td>1+</td><td>2+</td><td>3+</td></tr> <tr><td>shoulders (deltoids)</td><td>0</td><td>1+</td><td>2+</td><td>3+</td></tr> <tr><td>interosseous muscles</td><td>0</td><td>1+</td><td>2+</td><td>3+</td></tr> <tr><td>scapula (latissimus dorsi, trapezius, deltoids)</td><td>0</td><td>1+</td><td>2+</td><td>3+</td></tr> <tr><td>thigh (quadriceps)</td><td>0</td><td>1+</td><td>2+</td><td>3+</td></tr> <tr><td>calf (gastrocnemius)</td><td>0</td><td>1+</td><td>2+</td><td>3+</td></tr> </table> <p>Global muscle status rating 0 1+ 2+ 3+</p> </td> <td style="width: 50%; vertical-align: top;"> <p>Fat Stores</p> <table style="width: 100%;"> <tr><td>orbital fat pads</td><td>0</td><td>1+</td><td>2+</td><td>3+</td></tr> <tr><td>triceps skin fold</td><td>0</td><td>1+</td><td>2+</td><td>3+</td></tr> <tr><td>fat overlying lower ribs</td><td>0</td><td>1+</td><td>2+</td><td>3+</td></tr> </table> <p>Global fat deficit rating 0 1+ 2+ 3+</p> <p>Fluid status</p> <table style="width: 100%;"> <tr><td>ankle edema</td><td>0</td><td>1+</td><td>2+</td><td>3+</td></tr> <tr><td>sacral edema</td><td>0</td><td>1+</td><td>2+</td><td>3+</td></tr> <tr><td>ascites</td><td>0</td><td>1+</td><td>2+</td><td>3+</td></tr> </table> <p>Global fluid status rating 0 1+ 2+ 3+</p> </td> </tr> </table> <div style="border: 1px solid black; padding: 5px; margin-top: 10px; font-size: 0.8em;"> <p>Point score for the physical exam is determined by the overall subjective rating of the total body deficit. No deficit score = 0 points Mild deficit score = 1 point Moderate deficit score = 2 points Severe deficit score = 3 points</p> <p>Again, muscle deficit/loss takes precedence over fat loss or fluid excess.</p> </div> <p style="text-align: right;">Numerical Score for Worksheet 4 <input style="width: 50px;" type="text"/> D</p> <p style="text-align: right;">Total PG-SGA Score (Total numerical score of A+B+C+D) <input style="width: 50px;" type="text"/></p> <p style="text-align: right;">Global PG-SGA Category Rating (Stage A, Stage B or Stage C) <input style="width: 50px;" type="text"/></p> <p>Clinician Signature _____ RD RN PA MD DO Other _____ Date _____</p>		<p>Muscle Status</p> <table style="width: 100%;"> <tr><td>temples (temporalis muscle)</td><td>0</td><td>1+</td><td>2+</td><td>3+</td></tr> <tr><td>clavicles (pectoralis & deltoids)</td><td>0</td><td>1+</td><td>2+</td><td>3+</td></tr> <tr><td>shoulders (deltoids)</td><td>0</td><td>1+</td><td>2+</td><td>3+</td></tr> <tr><td>interosseous muscles</td><td>0</td><td>1+</td><td>2+</td><td>3+</td></tr> <tr><td>scapula (latissimus dorsi, trapezius, deltoids)</td><td>0</td><td>1+</td><td>2+</td><td>3+</td></tr> <tr><td>thigh (quadriceps)</td><td>0</td><td>1+</td><td>2+</td><td>3+</td></tr> <tr><td>calf (gastrocnemius)</td><td>0</td><td>1+</td><td>2+</td><td>3+</td></tr> </table> <p>Global muscle status rating 0 1+ 2+ 3+</p>	temples (temporalis muscle)	0	1+	2+	3+	clavicles (pectoralis & deltoids)	0	1+	2+	3+	shoulders (deltoids)	0	1+	2+	3+	interosseous muscles	0	1+	2+	3+	scapula (latissimus dorsi, trapezius, deltoids)	0	1+	2+	3+	thigh (quadriceps)	0	1+	2+	3+	calf (gastrocnemius)	0	1+	2+	3+	<p>Fat Stores</p> <table style="width: 100%;"> <tr><td>orbital fat pads</td><td>0</td><td>1+</td><td>2+</td><td>3+</td></tr> <tr><td>triceps skin fold</td><td>0</td><td>1+</td><td>2+</td><td>3+</td></tr> <tr><td>fat overlying lower ribs</td><td>0</td><td>1+</td><td>2+</td><td>3+</td></tr> </table> <p>Global fat deficit rating 0 1+ 2+ 3+</p> <p>Fluid status</p> <table style="width: 100%;"> <tr><td>ankle edema</td><td>0</td><td>1+</td><td>2+</td><td>3+</td></tr> <tr><td>sacral edema</td><td>0</td><td>1+</td><td>2+</td><td>3+</td></tr> <tr><td>ascites</td><td>0</td><td>1+</td><td>2+</td><td>3+</td></tr> </table> <p>Global fluid status rating 0 1+ 2+ 3+</p>	orbital fat pads	0	1+	2+	3+	triceps skin fold	0	1+	2+	3+	fat overlying lower ribs	0	1+	2+	3+	ankle edema	0	1+	2+	3+	sacral edema	0	1+	2+	3+	ascites	0	1+	2+	3+
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<p>Worksheet 5 – PG-SGA Global Assessment Categories</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <th style="text-align: left;">Category</th> <th style="text-align: left;">Stage A Well-nourished</th> <th style="text-align: left;">Stage B Moderate/suspected malnutrition</th> <th style="text-align: left;">Stage C Severely malnourished</th> </tr> <tr> <td>Weight</td> <td>No weight loss OR recent non-fluid wt gain</td> <td>≤ 5% loss in 1 month (≤ 10% in 6 months) OR Progressive weight loss</td> <td>> 5% loss in 1 month (> 10% in 6 months) OR Progressive weight loss</td> </tr> <tr> <td>Nutrient intake</td> <td>No deficit OR Significant recent improvement</td> <td>Definite decrease in intake</td> <td>Severe deficit in intake</td> </tr> <tr> <td>Nutrition Impact</td> <td>None</td> <td>Presence of NIS (Box 3 of PG-SGA)</td> <td>Presence of NIS (Box 3 of PG-SGA)</td> </tr> <tr> <td>Symptoms (NIS)</td> <td>OR significant recent improvement allowing adequate intake</td> <td></td> <td></td> </tr> <tr> <td>Functioning</td> <td>No deficit OR Significant recent improvement</td> <td>Moderate functional deficit OR Recent deterioration</td> <td>Severe functional deficit OR Recent significant deterioration</td> </tr> <tr> <td>Physical Exam</td> <td>No deficit OR chronic deficit but with recent clinical improvement</td> <td>Evidence of mild to moderate loss of muscle mass &/or muscle tone on palpation &/or loss of SQ fat</td> <td>Obvious signs of malnutrition (e.g., severe loss muscle, fat, possible edema)</td> </tr> </table>		Category	Stage A Well-nourished	Stage B Moderate/suspected malnutrition	Stage C Severely malnourished	Weight	No weight loss OR recent non-fluid wt gain	≤ 5% loss in 1 month (≤ 10% in 6 months) OR Progressive weight loss	> 5% loss in 1 month (> 10% in 6 months) OR Progressive weight loss	Nutrient intake	No deficit OR Significant recent improvement	Definite decrease in intake	Severe deficit in intake	Nutrition Impact	None	Presence of NIS (Box 3 of PG-SGA)	Presence of NIS (Box 3 of PG-SGA)	Symptoms (NIS)	OR significant recent improvement allowing adequate intake			Functioning	No deficit OR Significant recent improvement	Moderate functional deficit OR Recent deterioration	Severe functional deficit OR Recent significant deterioration	Physical Exam	No deficit OR chronic deficit but with recent clinical improvement	Evidence of mild to moderate loss of muscle mass &/or muscle tone on palpation &/or loss of SQ fat	Obvious signs of malnutrition (e.g., severe loss muscle, fat, possible edema)																																							
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Symptoms (NIS)	OR significant recent improvement allowing adequate intake																																																																			
Functioning	No deficit OR Significant recent improvement	Moderate functional deficit OR Recent deterioration	Severe functional deficit OR Recent significant deterioration																																																																	
Physical Exam	No deficit OR chronic deficit but with recent clinical improvement	Evidence of mild to moderate loss of muscle mass &/or muscle tone on palpation &/or loss of SQ fat	Obvious signs of malnutrition (e.g., severe loss muscle, fat, possible edema)																																																																	
<p>Nutritional Triage Recommendations: Additive score is used to define specific nutritional interventions including patient & family education, symptom management including pharmacologic intervention, and appropriate nutrient intervention (food, nutritional supplements, enteral, or parenteral triage).</p> <p>First line nutrition intervention includes optimal symptom management.</p> <p>Triage based on PG-SGA point score</p> <p>0-1 No intervention required at this time. Re-assessment on routine and regular basis during treatment.</p> <p>2-3 Patient & family education by dietitian, nurse, or other clinician with pharmacologic intervention as indicated by symptom survey (Box 3) and lab values as appropriate.</p> <p>4-8 Requires intervention by dietitian, in conjunction with nurse or physician as indicated by symptoms (Box 3).</p> <p>≥ 9 Indicates a critical need for improved symptom management and/or nutrient intervention options.</p> <p style="text-align: right;">©FD Ottery 2005, 2006, 2015 v3.22.15 email: faithotterymdphd@aol.com or info@pt-global.org</p>																																																																				

Appendix 2

Summarised frequency of difficulty and comprehensibility scores 1, 2, 3 and 4 reported by participants before training (T0) and after training (T1)

Score	T0 Difficulty total, n (%)	T1 Difficulty total, n (%)
1 Very difficult	33 (7)	1 (0)
2 Difficult	162 (36)	67 (14)
3 Easy	225 (50)	335 (71)
4 Very easy	32 (7)	69 (15)
Total	452 (100)	472 (100)
Overall item response	92%	96%
Score	T0 Comprehensibility total n (%)	T1 Comprehensibility total n (%)
1 Very unclear	18 (4)	1 (0)
2 Unclear	122 (27)	23 (5)
3 Clear	286 (62)	376 (79)
4 Very clear	31 (7)	77 (16)
Total	459 (100)	477 (100)
Overall item response	93%	97%